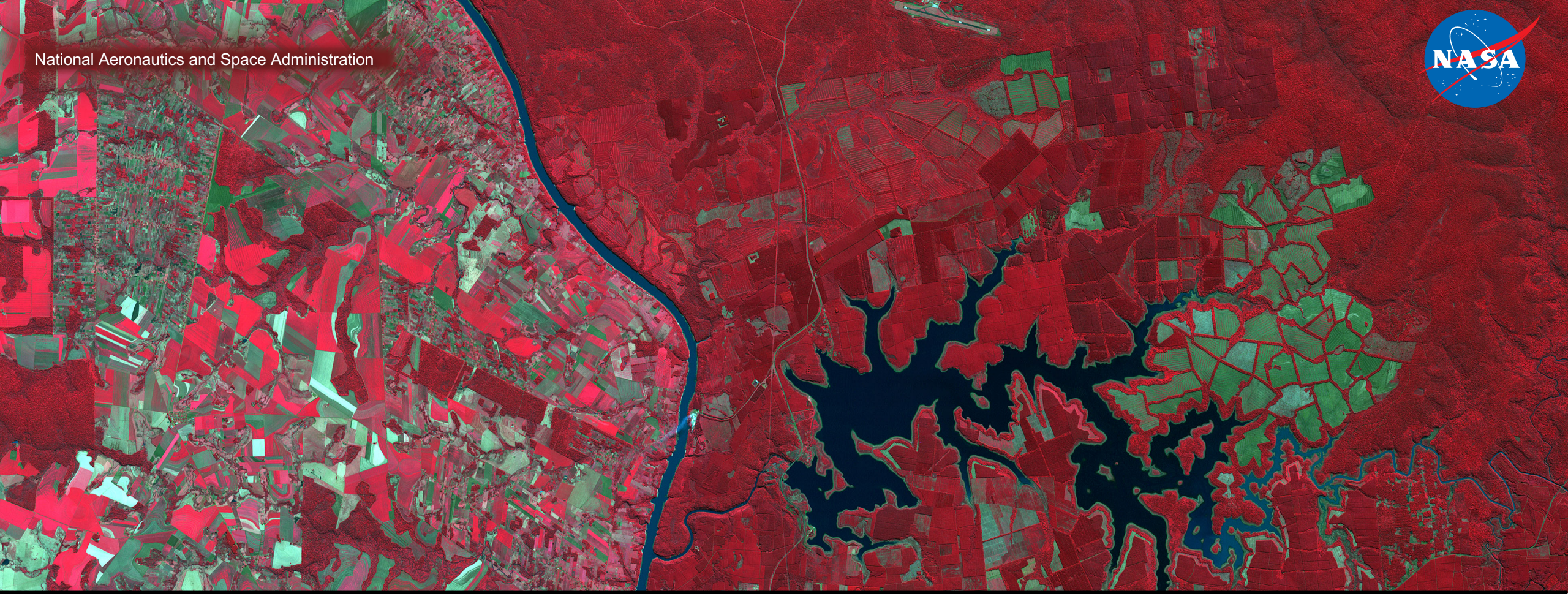

Access and Examine Landsat Land Cover (LC) Over the Sao Francisco Verdadeiro (SFV) Watershed

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Objectives

By the end of this exercise, you will be able to select, download, and analyze tree cover and bare ground data over the Sao Francisco Verdadeiro (SFV) watershed using the Landsat Land Cover (LC) portal and QGIS

Requirements

- QGIS installed on your computer
  - https://arset.gsfc.nasa.gov/sites/default/files/water/drought/Introduction%20to%20QGIS.pdf
- A shapefile for the Sao Francisco Verdadeiro watershed saved on your computer
  - http://arset.gsfc.nasa.gov/

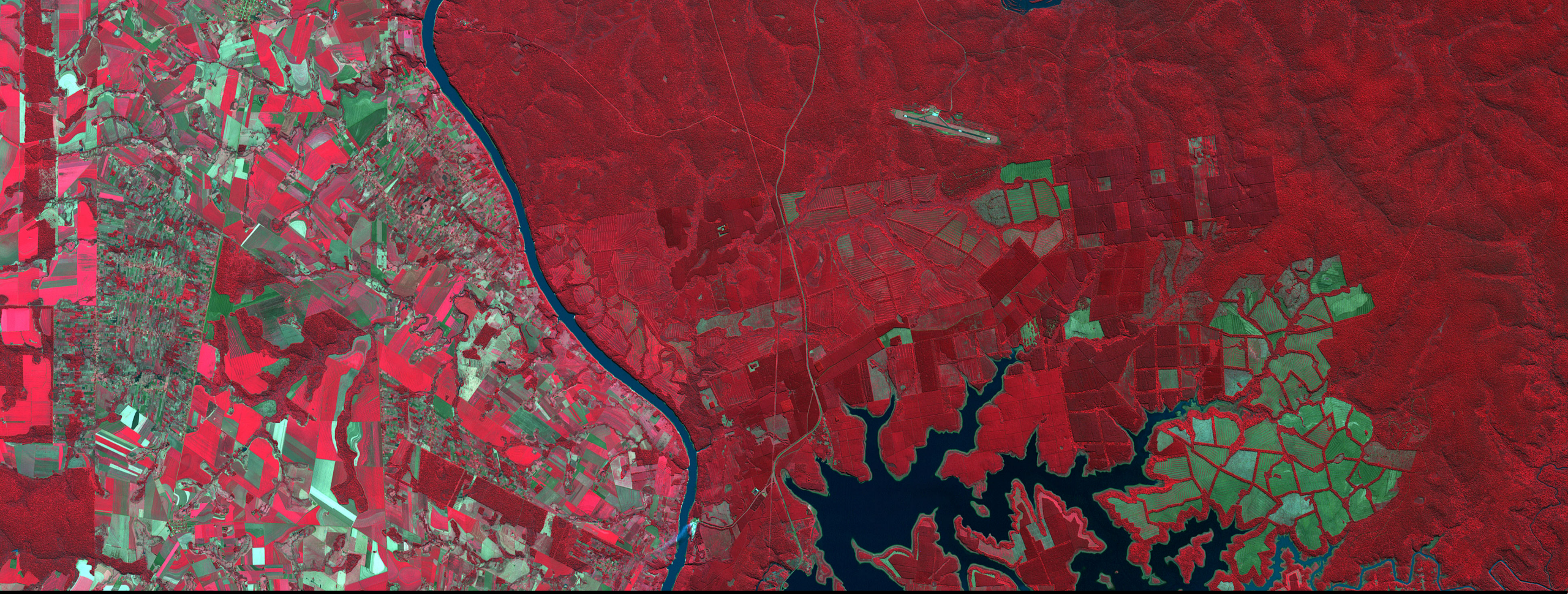
Outline

- Part 1: Select and Download Landsat Land Cover Data
- Part 2: Examine Tree Cover and Bare Ground Extent Using QGIS

Note

- Bare ground and tree cover data are in per pixel percent coverage based on 2000-2012 annual Land Cover
  - Bare soil cover is based on growing season coverage and represents minimum value
  - Tree cover is based on canopy cover within each pixel for trees 5 m or taller*
- Water mask data is also available
  - Provides an overview of long-term mean water masks, areas dominated by tree cover, areas that may be bare ground, or other types of land cover over the SFV watershed

*Reference: Hansen, M. C., S. V. Stehman, P. Potapov, 2010: Quantification of global gross forest cover loss, PNAS, 107, 8650-8655, doi: 10.1073/pnas.0912668107



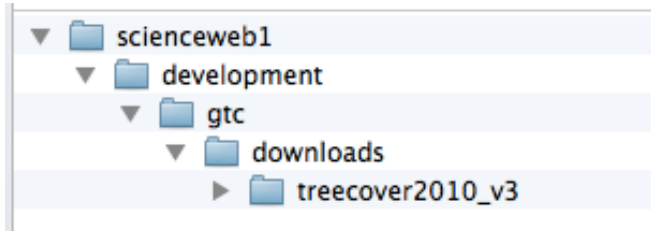
Part 1: Select and Download Landsat Land Cover Data

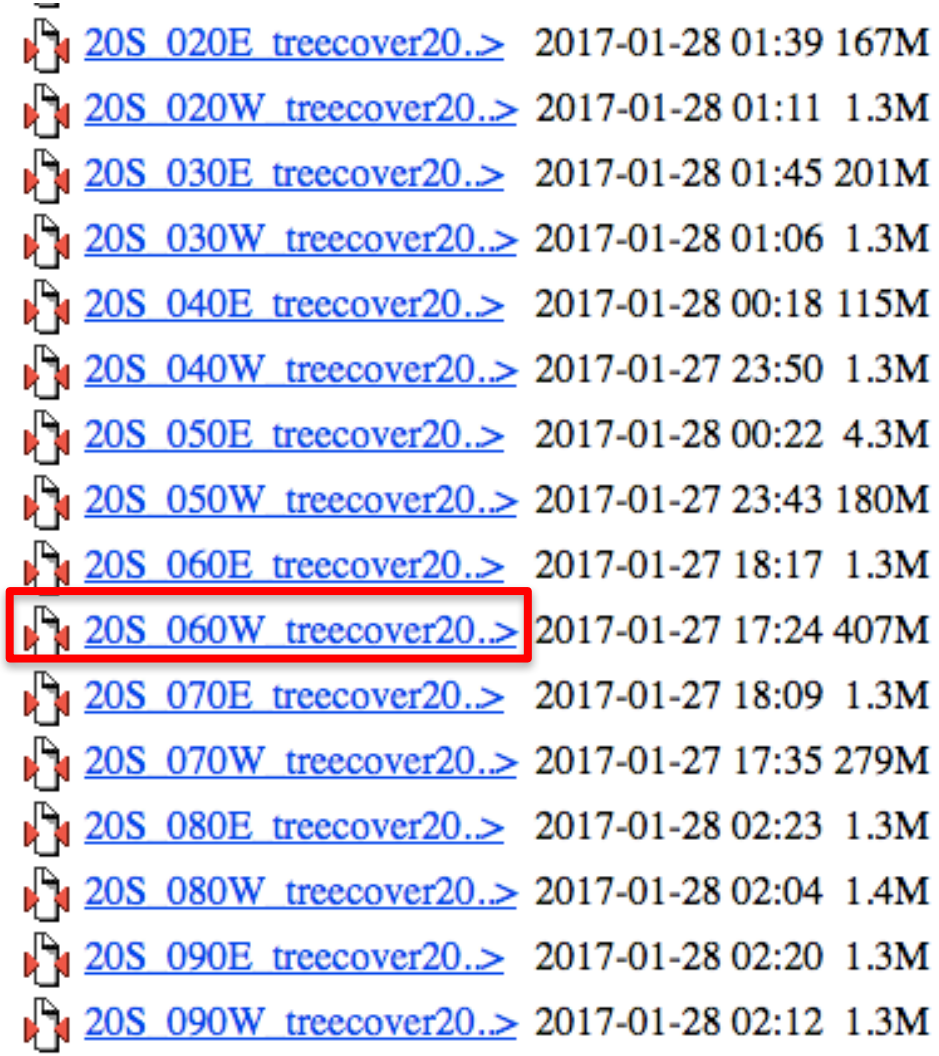
Select and Download Landsat Land Cover Data

1. On your computer make a folder named **Land-Cover**
2. Go to https://landcover.usgs.gov/glc/
3. You will see links to Global 30 m Tree Cover, Global 30 m Water, and Global 30 m Bare Ground data
4. Click on **Get Data** on top of the Global 30 m Tree Cover
5. Click on **Individual Download**
6. You will see a list of data files in 10° tiles covering the globe

Select and Download Landsat Land Cover Data

7. Scroll down to the tile for 20°S and 60°W that contains the SFV watershed
8. Click on the link and save the file on your computer **as zip archive (with .zip)**
9. You will get a file named **20S_060W_treecover2010_v3.zip**
10. Click on the file name to unzip the data and you will get a folder **Stornext** with the following sub-folders:





Select and Download Landsat Land Cover Data

11. In the treecover2010_v3 sub-folder you will have the tree cover data tile **20S_060W_treecover2010_v3.tif**
12. Move the **20S_060W_treecover2010_v3.tif** to the **Land-Cover** folder on your computer

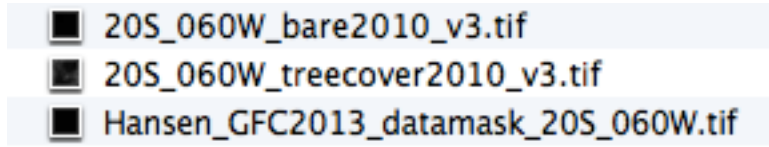
Water Mask

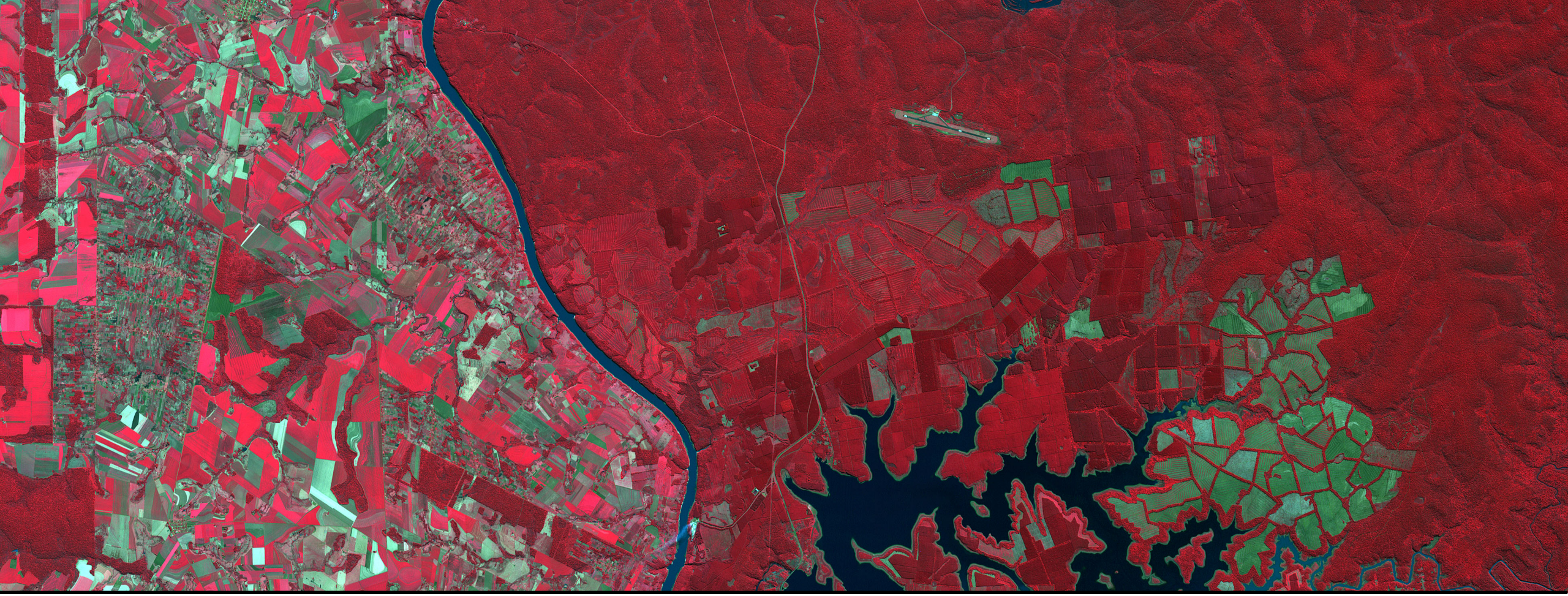
13. Go back to https://landcover.usgs.gov/glc/ and click **Get Data** over **Global 30 m Water**
14. When you click on **Individual Download** you will see that the file names are different **(Hansen_GFC2013—)**, but moving the curser on the file name will show the full name with latitude-longitude of the tile included in the file

Select and Download Landsat Land Cover Data

14. Follow Steps 7-12 to save the file **Hansen_GFC2013_datamask_20S_060W .tif** containing water mask, in the Land-Cover folder on your computer
    - Note: be sure to download the file with the extension .tif.zip from the site
15. Repeat Steps 2-12 for the **Global 30 m bare ground** data
16. Save the file **20S_060W_bare2010_v3** in the Land-Cover folder
17. At the end of this part you will have the data files to the right in the Land-Cover Folder

Bare Ground





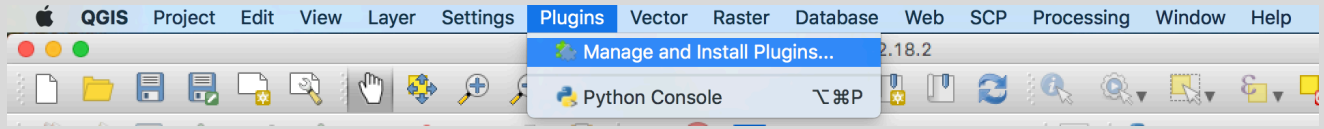
Part 2: Examine Tree Cover and Bare Ground Extent Using QGIS

Examine Tree Cover and Bare Ground Extent Using QGIS

1. Open QGIS and start a new project
2. From the top menu, click on **Web**, select **Open Layer Plugin** and select the background map **OpenStreetMap**

If you do not have the OpenLayers Plugin

- Select **Plugins** from the top menu, and choose **Manage and Install Plugins**
- You will get a window with options for Plugins
- Enter OpenLayers in the search window
- Clicking on the **OpenLayers Plugin** and press **Install** in the bottom right

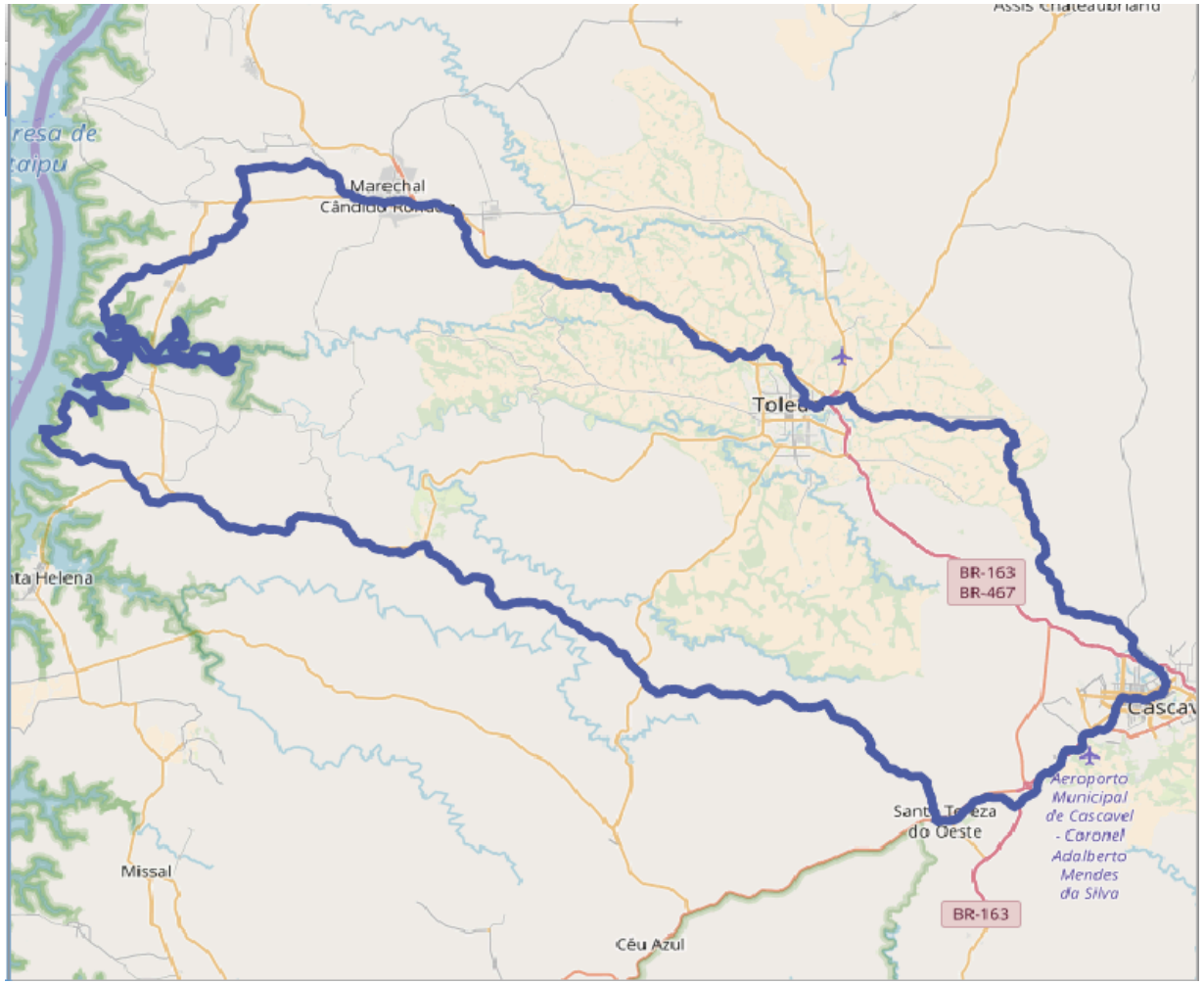


Examine Tree Cover and Bare Ground Extent Using QGIS

3. Click on the menu on the left bar and click **Add Vector** to add the SFV shapefile: sfv_4326.shp
4. To make the shapefile transparent with only the border left, right click on the layer file and go to **Properties** > **Style**
5. Click on the down arrow in the Fill window and select **Transparent fill**

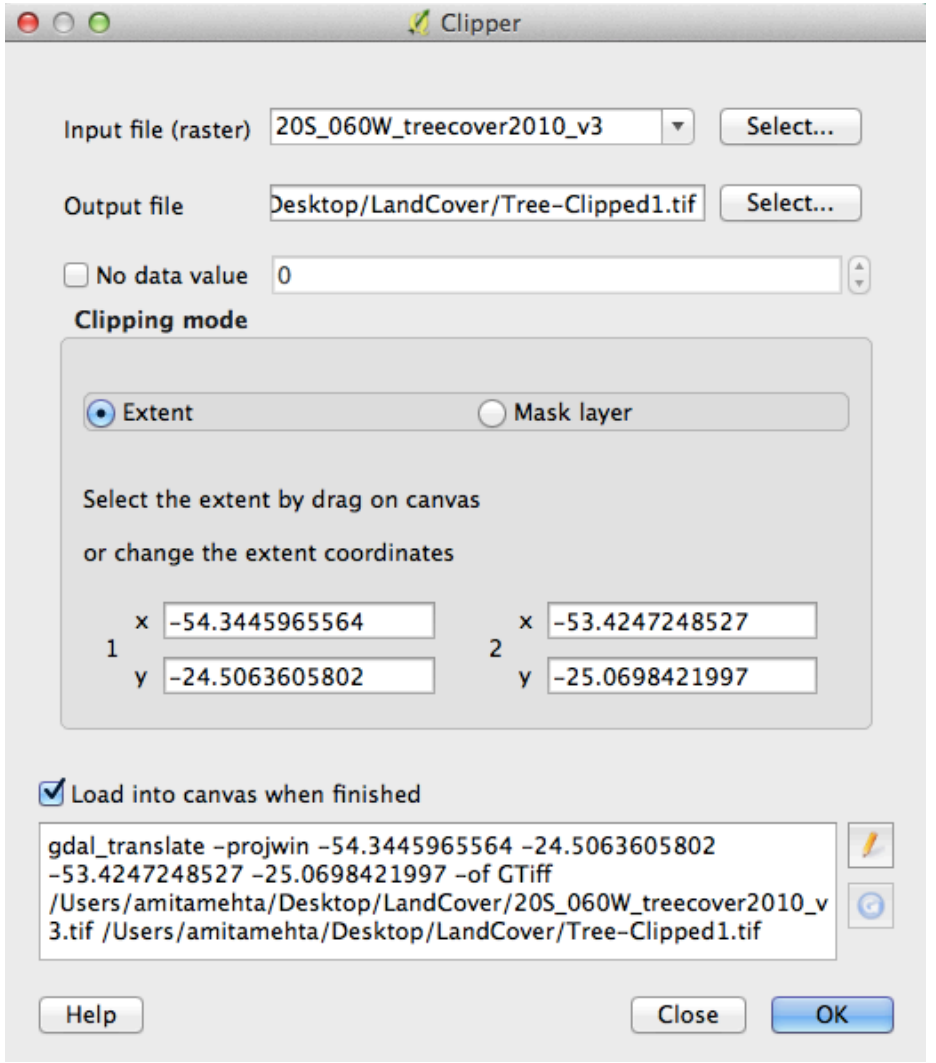
Examine Tree Cover and Bare Ground Extent Using QGIS

6. Click on the down arrow in the **Outline** window and choose a color of the shapefile boundary (This example uses purple)
7. Set the **outline width** to be 2.0
8. Click **OK** to get the following result in the QGIS window



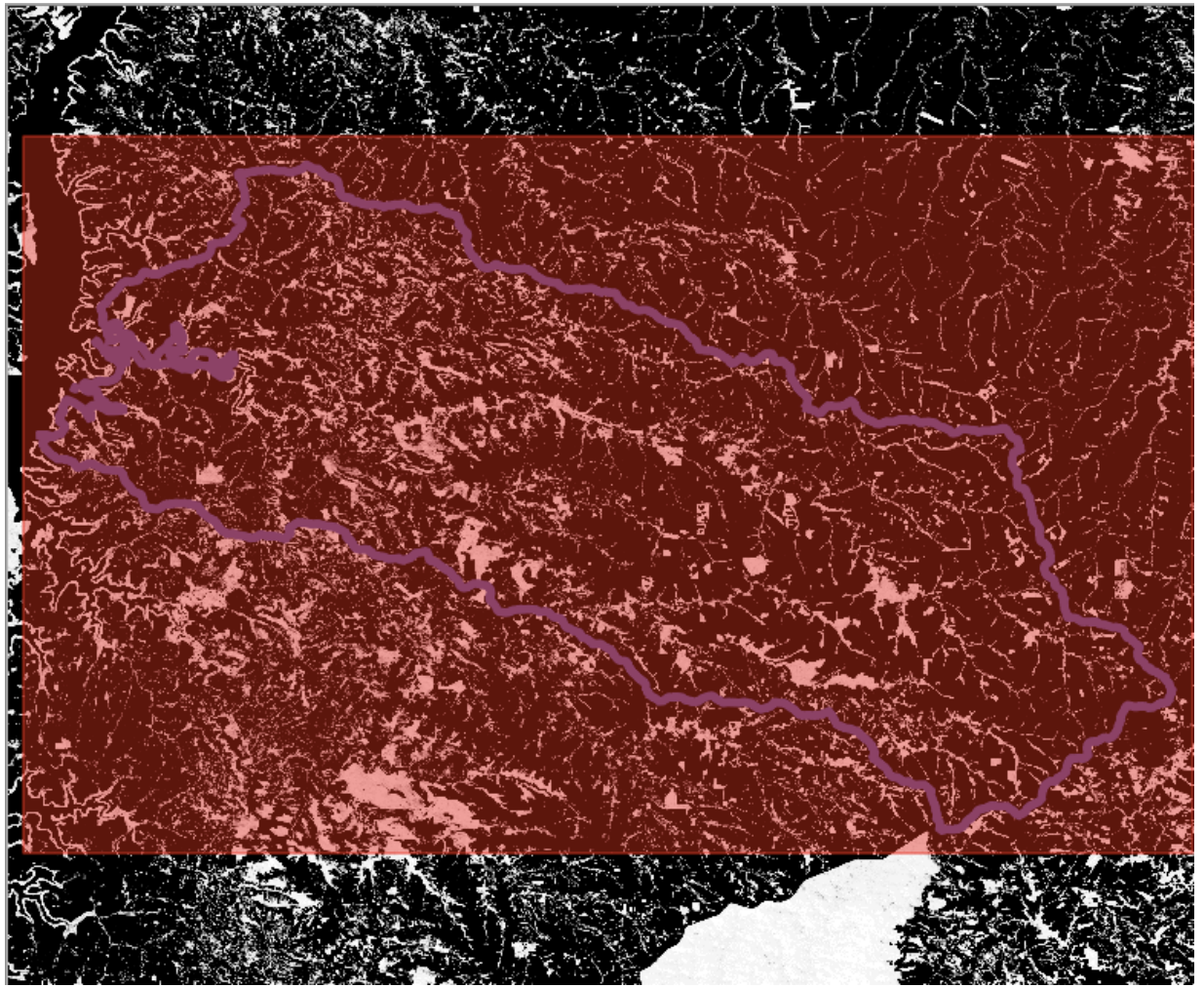
Examine Tree Cover and Bare Ground Extent Using QGIS

9. Next click on the **Add Raster** function on the left
10. Navigate to the Land-Cover folder and click to open **20S_060W_treecover2010_v3.tif** data file
11. You will see the GeoTIFF images appear in grayscale
12. Now clip the tree cover raster layer to the SFV shapefile
13. This is a raster with large dimension, so we will clip this data in two steps



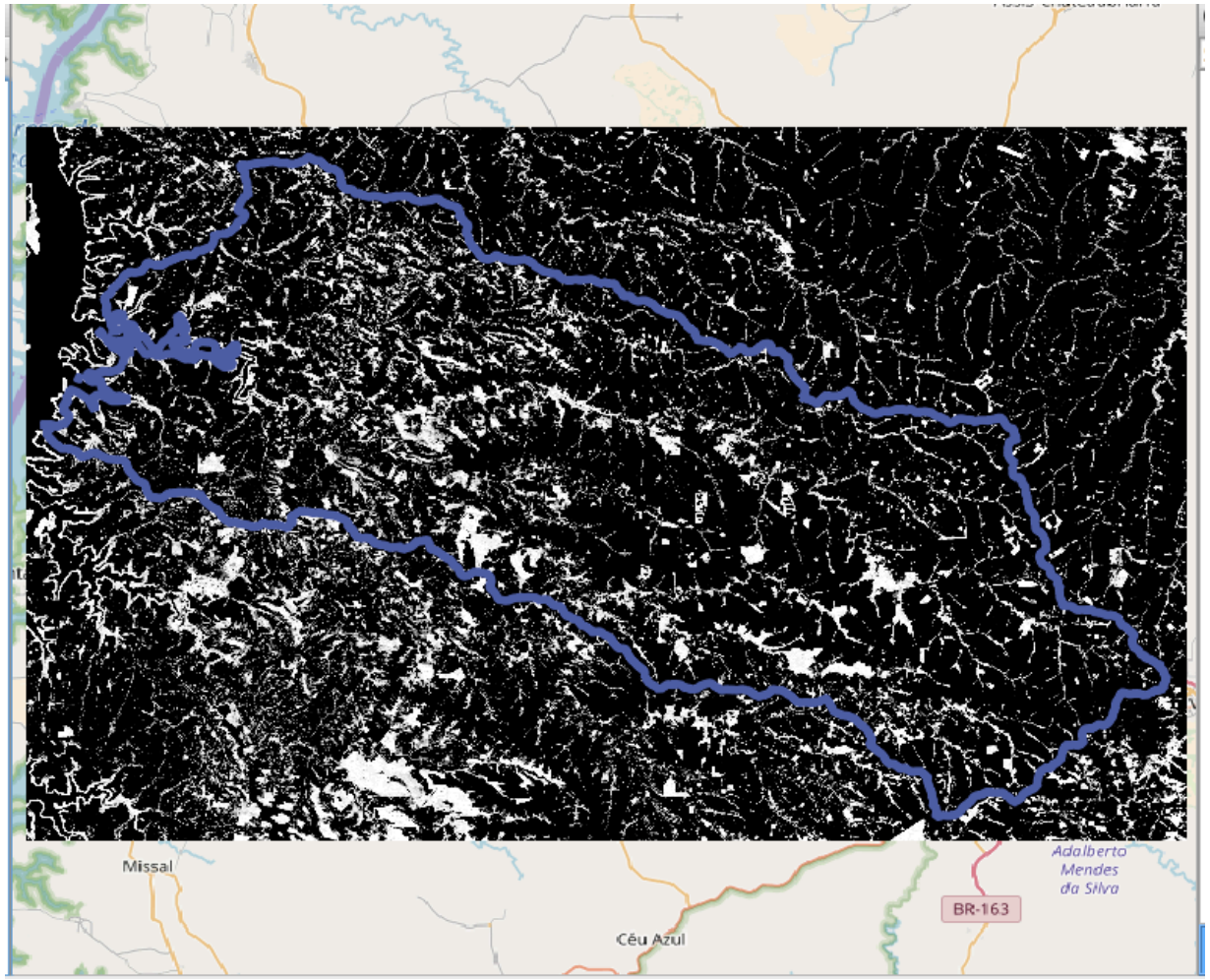
Examine Tree Cover and Bare Ground Extent Using QGIS

14. On the top bar go to **Raster** > **Extraction** > **Clipper** to open the Clipper options window
15. You will see **Extent** selected in the window
16. Enter **Output file** name by clicking on Select (Suggestion: **tree-Clipped1.tif**)
17. Drag the cursor across the map so that just the area around the shapefile is covered



Examine Tree Cover and Bare Ground Extent Using QGIS

18. You will then see the rectangular clipped layer on the map
19. You can uncheck or remove the previous layer
    - Right click on the raster name in the **Layer Panel** > **Remove**
20. Now clip the pre-clipped layer to the SFV shapefile
21. On the top menu, go to **Raster** > **Extraction** > **Clipper** to open the Clipper options window

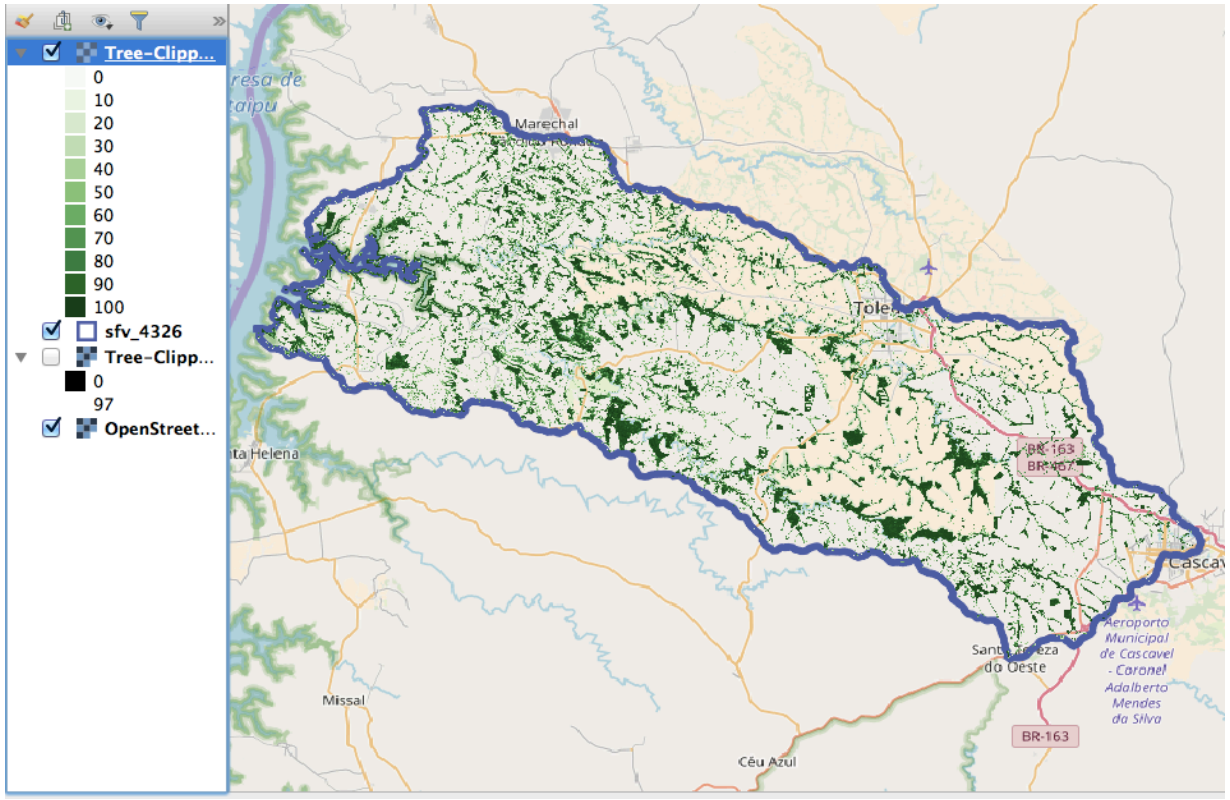


Examine Tree Cover and Bare Ground Extent Using QGIS

22. In the Input File (raster) window select the rectangular, clipped file: **Tree-Clipped1**
23. In the Output file window select output folder and enter file name (Suggestion: **Tree-Clipped2**)
24. Check the **Mask Layer** and in the **Mask Layer** window select the shapefile named **sfv_4326**
25. Click **OK** on at the bottom right.
    - You should see the data clipped by the shapefile boundary
26. To create a colored tree cover map, right click on the clipped raster layer
27. Go to **Properties** > **Style**

Examine Tree Cover and Bare Ground Extent Using QGIS

28. Select the **Render Type** as **Singleband Pseudocolor**
29. Next to **Color**, make sure the color palette is green by selecting (**Greens**)
30. Select **Min** value to 0 % and **Max** value to 100%
31. Below the color display, change the **Mode** to **Equal Interval** and **Classes** to 11. Click **Classify**, then click **Apply**.
32. Click **OK** to close the Change Color box



Examine Tree Cover and Bare Ground Extent Using QGIS

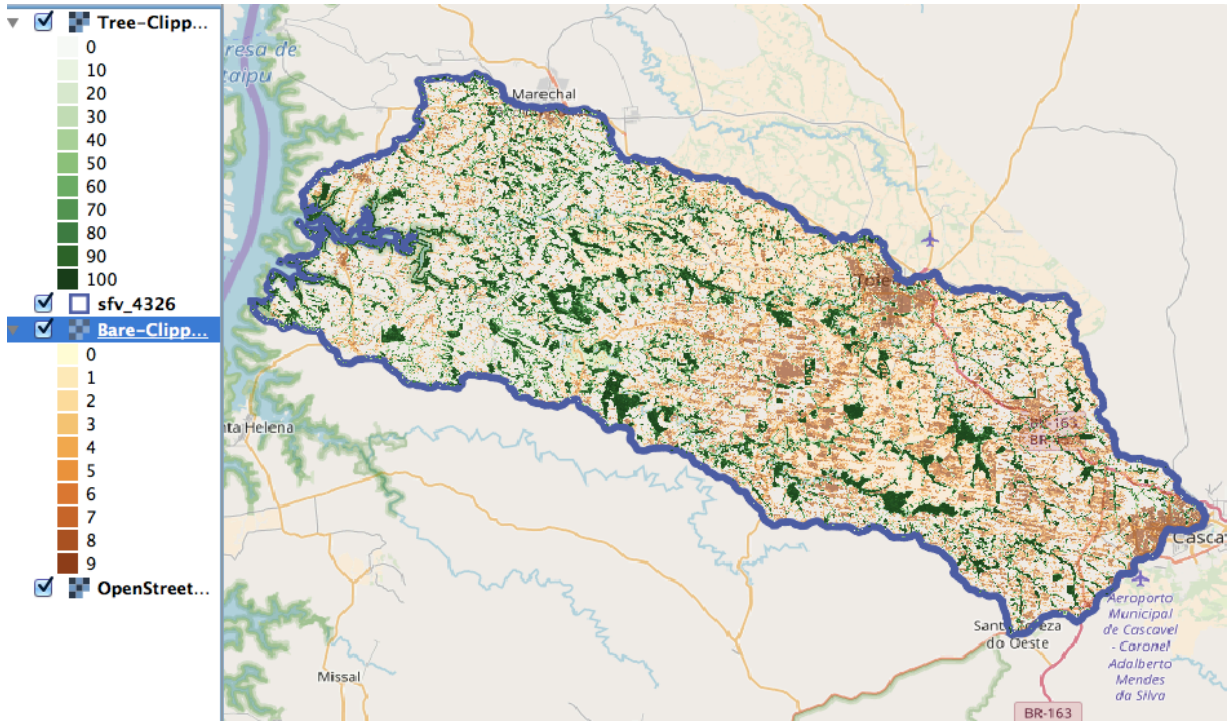
33. Make the clipped tree cover layers transparent to see the map underneath and to mask 0% values
34. Right click on the layer file and go to **Properties** > **Transparency**
35. Set the **Transparency** level to 50%
36. Under **No data value** enter 0 in **Additional no data value**
37. Click **Apply** and then **OK**

Examine Tree Cover and Bare Ground Extent Using QGIS

39. Repeat steps 9-11 but use the raster layer of bare ground cover from file **Land-Cover/20S_060W_bare2010_v3.tif**
40. Repeat Steps 12-25 with the two-step clipping of the raster layer, first with a rectangle and then using the SFV shapefile mask
41. Save the final, clipped file as **Bare-Clipped2.tif**
42. Repeat steps 26-32, but use yellow-orange-brown color (YlOrBr), min=0, max=9, with **Mode** set to **Equal Interval** and 10 **Classes**
43. Repeat steps 33-37 to make the layer 50% transparent and set **No data value** to 0 for **Additional no data value**

Examine Tree Cover and Bare Ground Extent Using QGIS

44. Display both Tree-Clipped2 and Bare-Clipped2 and examine the spatial land cover patterns
45. Add the water mask raster



Discussion Questions

1. Which part of the watershed has more wooded/forest areas in general?

2. What is the maximum per cent of bare ground cover noted on the watershed? Identify areas with large areas of bare ground.

Hint

Examine each layer individually and also note the geographic features in OpneStreetMap